Attorney Docket No. 25-273

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant:	Hiromitsu YAMAKAWA		
Application Number:	10/811,816	Art Unit No.:	2861
Filed:	March 30, 2004	Examiner:	PHAM, Hai C.
For:	LASER ARRAY IMAGING LENS AND AN IMAGE-FORMING DEVICE USING THE SAME		

REPLY BRIEF

Commissioner for Patents
P.O. Box 1450
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November 13, 2007

Sir:

Responsive to the Examiner's Answer dated September 13, 2007, please enter this Reply Brief.

RESPONSE TO EXAMINER'S ARGUMENT

At page 12 of the Examiner's Answer, in response to Appellant's argument that the term 'imaging lens' is well known and widely used by those of ordinary skill in the art to refer to a type of lens that is designed to have low distortion and to image an object having an extended area so that the image faithfully resembles the object, it is stated that the "examiner respectfully disagrees". The Examiner then goes on to state that the basis (for disagreement) is that the term 'imaging lens' as defined by the Appellant " . . . only refers to a small category of lens that has low distortion and that images an object having an extended area" (sic). Appellant does not disagree that the term 'imaging lens' only refers to a small category of lenses, namely, ones having low distortion that can image an object having an extended area. Thus, the point the Examiner is making here is not clear to Appellant.

In the next sentence, the Examiner states "The current Specification is completely silent with regard to the specific characteristic attributed to the imaging lens as stated by the Appellant . . .".

In response to this argument, it should be noted that:

(A) the Background of the Invention section of the specification, as filed, states:

> "A well-known rotary polygon mirror has been generally used as the light scanning means in image-forming devices such as laser printers. Although a rotary polygon mirror provides superior scanning in terms of both higher speed and better accuracy in capturing or reproducing the correct shading as compared to when a galvanometer mirror is used for scanning, the subtle bending of scanning lines, the variation of scanning line pitch, as well as the variation of scanning line length that result from manufacturing variations deteriorate the quality of scanning when a rotary polygon mirror is used. Moreover, in a scanning unit that uses such a rotary polygon mirror, a sensor for detecting the timing of the scans is needed for making the starting points coincide. Furthermore, vibrations and/or noise may be generated due to the rotational operation of a rotary polygon mirror.
>
> Various problems as described above arise when a rotary polygon mirror is used to scan a light beam. Moreover, there is a limitation as to both the scanning speed and acceleration of a rotary polygon mirror.

Imaging techniques that are equivalent in result to scanning a laser light without using a rotary mirror have been investigated to further enhance the image-forming speed. When such techniques are used, beams from laser light sources need to be accurately guided onto a surface, and thus the development of an laser array imaging lens suited to this task is required.

Image-forming devices that use a so-called semiconductor laser array made by arraying multiple light emitting elements in rows as a light source and that use a laser array imaging lens that images light beams from such a light source onto a surface to be scanned are described Japanese Laid-Open Patent Applications H10-16297 and 2000-249915.

However, the laser array imaging lens described in Japanese Laid-Open Patent Application H10-16297 has a seven lens element construction that uses only spherical lenses. A laser array imaging lens of a lighter and simpler construction than this conventional example has been desired. Further, the laser array imaging lens described in Japanese Laid-Open Patent Application 2000-249915 is constructed of two anamorphic, aspheric lens elements and a stop. The two anamorphic, aspheric lens elements function to refract light rays that are situated at the center of the light beams that are incident onto the laser array imaging lens parallel to the optical axis so that they intersect in a region positioned on the optical axis of the laser array imaging lens, and a stop is placed at this position on the optical axis to thereby make the laser array imaging lens telecentric on the light-source side."

(B) Moreover, the Brief Summary of the Invention section, as filed, states:

"The present invention relates to an image-forming device, such as a laser printer, in which the light source is a semiconductor laser array made by arraying multiple light emitting elements in rows. Light is guided onto a surface to be scanned from the semiconductor laser array so as to form reproduced images on the surface to be scanned. In addition, the present invention relates to a laser array imaging lens that may be used in such an image-forming device. More particularly, the present invention provides a laser array imaging lens of simple construction that may be used to scan laser light from a semiconductor laser array light source onto a surface to be scanned without using a rotary polygon mirror, and an image-forming device such as a laser printer using the same."

(C) In the Detailed Description portion of the specification

(1) lines 6 - 20, of page 5 state:

"The above semiconductor laser array light source 1 is made by arraying over 2,000 very small semiconductor laser elements (called laser elements hereinafter) in one or more straight lines as light emitting elements. The individual laser elements can be modulated independently based on a prescribed signal so together they produce a "scan line" in the traditional sense. Although the term "scan line" is used herein, it should be noted that the present invention enables an entire line of light emitting elements, or even multiple lines of light emitting elements, to be imaged simultaneously onto an image surface so as to record one or more "scan lines".

A light source having over 2,000 laser elements is needed to illuminate a scan line with a length sufficient to scan A6 size paper at a pitch of 600 dots per inch. Actually, since the short side of A6 paper (postcard size paper) has a length of 105 mm, if the A6 paper is oriented with its short side in the main scanning direction, the number of laser elements that should be arrayed is (600 dots per inch) times (105 mm / (25.4 mm per inch)) = 2,480 dots. However, printing is usually not needed for a range of several mm in each margin of the short side. Therefore, if over 2,000 laser elements are arrayed in a straight line, the printing of a scanning line at a pitch of 600 dots per inch onto A6 paper can be accomplished."

(2) lines 4 - 17 of page 6 state:

"The present invention eliminates problems that arise when using a rotary polygon mirror as a light scanning means because no rotary polygon mirror is needed according to the present invention, since the light beams from respective laser elements are modulated independently and are output to form a dot array line that is equivalent to a single scanning line. Namely, various problems that accompany the skewing of the mirror surfaces, such as variation in the scanning line pitch, do not arise because light scanning is not carried out by a mechanical light scanning means such as a rotary polygon mirror. Further, a sensor as is necessary in the case of using a rotary polygon mirror to obtain the timing of the start of the scanning lines is unnecessary. In addition, vibration and noise that accompany scanning in the traditional sense, are all but eliminated, and a long service life of the image scanning device can be anticipated because there are no

high-speed moving parts, as when using a rotary polygon mirror. In addition, higher printing speeds can be achieved because the laser elements arrayed in a straight line can simultaneously emit light so as to print an entire line, or even multiple lines, onto a surface to be scanned simultaneously."

(3) for the first embodiment of the laser array imaging lens according to the invention, lines 28 - 35 of page 15 state:

"Figs. 6A - 6D show the spherical aberration, astigmatism, distortion and lateral color, respectively, for this embodiment. The spherical aberration (in mm) is shown for the wavelengths 770 nm, 780 nm and 790 nm, the astigmatism (in mm) is shown for both the sagittal S and tangential T image surface, and the lateral color (in mm) is shown for the wavelengths 770 nm and 790 nm. The f-number F_{NO} of this embodiment is listed in Fig. 6A and the maximum ray height y'= 105 mm is listed in Figs. 6B - 6D. Fig. 6E shows the coma (in mm) for ray heights y' of zero, 73.5 mm and 105 mm. As is evident from Figs. 6A - 6E, all these aberrations are favorably corrected for a wavelength of 780 nm." and,

(4) for the second embodiment of the laser array imaging lens according to the invention, a similar statement appears for Figs. 7A - 7D as that quoted in para. 3 above for Figs. 6A - 6D. As can be seen in Figs. 6C and 7C, the distortion is less than 2 % for the entire range of image heights (i.e., from on axis image points to image points having an image height Y' equal to 105 mm).

As is apparent to one of ordinary skill in the art who has read Appellant's specification, the specification is **not** silent as to the distortion characteristics of the laser array imaging lens of the present invention **or** of the fact that the broader claims of the present invention, drawn to "A laser array imaging lens", in part differ from prior art lenses used in scanning by being able to image an object without using a rotating scanning means, such as a rotating polygonal mirror. Because all f·θ lenses have high distortion, they can image an extended object only when used in conjunction with a rotating scanning means, such as a rotating polygonal mirror, that scans the focus point of the f·θ lens in the main scanning direction. Moreover, Appellant's specification is not silent as to the fact that the laser array imaging lens of the present invention is able to achieve

the **equivalent** of scanning, without using a rotating scanning means that causes prior art scanning systems to suffer from the deficiencies discussed in Appellant's specification. Thus, the Examiner has improperly determined the scope of the term "laser array imaging lens" (in, for example, claim 1) as 'reading on' an f·θ lens, since all f·θ lenses have high distortion and thus require a separate scanning means, such as a rotary polygon mirror, in order to scan the beam in the main scanning direction. Clearly, the Examiner has not read the claims in light of the specification, of which they are a part, in determining the claim scope of the broader claims, and has improperly interpreted the scope of the broader claims as reading on f·θ lenses of the prior art. This is entirely inconsistent with the specification, since no f·θ lens is capable of achieving the stated objectives of the invention.

With regard to the Examiner's position that "imaging" associated with "lens" is a ". . . well known broad term to refer to any type of lens that focuses and forms an optical image", the Examiner has **not** established that this term is well known to those of ordinary skill in the art **with the meaning ascribed by the Examiner**. All the Examiner has established is that a small number of patents use the term "imaging lens" in a generic fashion. However, this usage in these small number of patents is contrary to the meaning of the term "imaging lens" as used by the vast majority of those of ordinary skill in the art, who use the term to refer to a species of lenses that does not include f·θ scanning lenses. Certainly, the Examiner has not established that the term 'laser array imaging lens" (emphasis added) is a well-known term of art that is inclusive of f·θ lenses.

With regard to the Examiner's statement (in the paragraph spanning pages 12 - 13 of the Examiner's Answer) that "The f·θ lens as taught by Ishibe et al., is an imaging lens that meets all the claimed structural limitations as recited in claims 1 and 9 . . .", it should be noted that the Examiner reaches this conclusion by first parsing the term "laser array imaging lens" into two parts, and then ignoring the meaning this term would convey to a person of ordinary skill in the art who had read Appellant's specification. Thus, the Examiner has not considered "the invention as a whole" as defined by the claims when read in light of the specification. This issue

will be discussed later in more detail. It is entirely appropriate for one to draft a claim using terminology in the preamble **meant to limit the claim scope**. If the claim scope when read in a vacuum can be interpreted two or more ways, the claim is to be interpreted by the Examiner as broadly as possible in a manner that is not inconsistent with the specification. Thus, the specification must be read to see if it sheds light on the intended scope of a claim. In this case, the specification indeed does shed light on the intended scope of the claims. Moreover, it would appear to the undersigned that, once the Examiner has clearly established in the record that the claim scope is admitted by an applicant for a patent to be limited by wording contained in the claim preamble, from that point forward, there is no public interest served by the Examiner continuing to reject such a claim on prior art that is only relevant to a broader claim scope that has been disavowed by the applicant for patent.

With regard to the Examiner stating (near the bottom of page 13 of the Examiner's Answer) that f·θ lenses are ". . . well known in the art to perfectly perform the scanning and imaging of the light beams emitted from a plurality of laser light sources or laser array . . . ", the Examiner's statement was made in response to the Appellant's previous argument. However, in making that previous argument, the Appellant intended the term "laser array imaging lens" to be construed in a manner **not inconsistent** with Appellant's specification. Even though the laser array of Ando is used to write multiple pixels (or to form colored segments of a single pixel of a color image), the **lens** of Ando is an f·θ scanning lens and thus it clearly is **not** capable of forming an image of an extended object without using an additional scanning means, such as a rotating polygonal mirror, to achieve scanning in the main scanning direction. Therefore, the lens of Ando is clearly **not** a "laser array imaging lens" as this term has been used in Appellant's specification and claims to refer to a lens that is capable of achieving the equivalent of scanning in the main scanning direction without using a rotating scanning means.

The Examiner states, in the sentence bridging pages 14 and 15 of the Examiner's Answer, ". . . the recitation of the "laser array" has not been given patentable weight" (here, the Examiner is clearly referring to only a portion of the recitation 'laser array imaging lens') "because the

recitation occurs in the preamble." The Examiner goes on to state: "A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone". Appellant does not disagree with this latter sentence. However, it is clear from the word "generally" that there **are** occasions in which a term contained in a claim preamble **must be given patentable weight**, even if the claim body does not refer back to said term. Moreover, M.P.E.P. §2111.02 (as will be discussed below) clearly supports the notion that there are occasions when a term contained in a claim preamble but not the body of a claim must be given patentable weight. Appellant disagrees with the Examiner's assertion that the "limitation with regard to the 'laser array' occurs only in the preamble" (of claims 1 and 9) ". . . **where it merely recites the purpose of a process or the intended use of a structure** . . ." (emphasis added). Such an assertion is entirely inconsistent with the teachings of the specification that have been quoted on pages 3 - 6 of this Reply Brief.

Moreover, the Examiner is referred to M.P.E.P. §2111.02 that states: "Any terminology in the preamble that limits the structure of the claimed invention must be treated as a claim limitation. See, e.g., *Corning Glass Works v. Sumitomo Electric. USA.*, 868 F.2d 1251, 9 USPQ2d 1963, 1966 (Fed Cir. 1989)". In that case, the term in the preamble that Sumitomo wished the Federal Circuit to give no patentable weight to, so that the patent would then be invalid by being anticipated by a prior art reference, was "optical waveguide". There was no later reference in the body of the claim to 'optical waveguide'. Yet, the term in the preamble was held to be a proper claim limitation.

As mentioned above, the term "laser array imaging lens" as used in the preamble of Appellant's claims 1 and 9 is clearly **not** merely to recite the purpose of a process or the intended use for the invention, as Appellant's specification teaches otherwise. Moreover, it is clear that the preambles of claims 1 and 9 do not merely summarize the invention and its purpose, as Appellant's specification teaches otherwise. Still further, it is clear that the preambles of claims

1 and 9 are indispensable in defining the intended scope of the invention being claimed by those claims.

In determining the scope that the term "laser array imaging lens" should be accorded in claims 1 and 9 (as well as in claims 2 and 10 that depend from claims 1 and 2, respectively), the Examiner has clearly ascribed a scope that is too broad**,** since the meaning ascribed to said term is entirely **inconsistent** with Appellant's specification.

Moreover, it is improper for the Examiner to **parse** the term "laser array imaging lens" into **two** parts and to then give **no** patentable weight to ***part*** of the term 'laser array imaging lens" on the basis that the term "laser array imaging lens" is not used again in the body of Appellant's claims 1, 2, 9 and 10. Instead, the Examiner **must** construe the claimed invention '**as a whole**' when read 'in light of the specification' so as to 'not be inconsistent with the specification'. See, for example, those cases cited in M.P.E.P §2111.02., and note especially the section entitled "Claim Construction" at pages 619- 621 of the *Bell Communications Research, Inc. v Vitalink Communications Corporation* opinion. Moreover, it should be noted that the term "laser array imaging lens" **does occur** in the body of claims 3 - 8 and 17 - 20. Because claims 11 - 16 are dependent claims that depend from claims 3 - 8, respectively, each of these claims must also be considered as containing the term "laser array imaging lens" in the body of the claim.

For the above reasons, it is respectfully submitted that all of the rejections of record should be reversed.

Respectfully submitted,

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